Michaelis-Menten Simulation App Manual

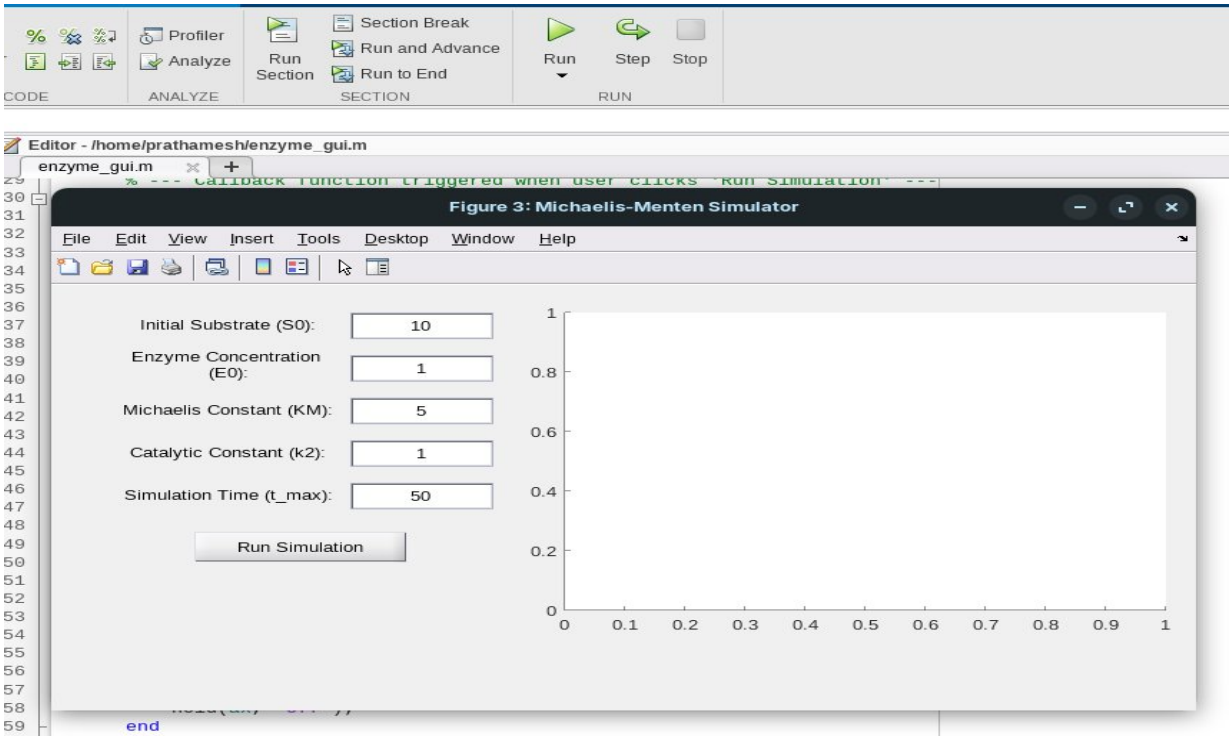
GROUP 3 | ESC113 Term Project | 2025

Introduction

This manual provides a step-by-step guide to using the Michaelis-Menten Simulation GUI built in MATLAB. The app allows you to simulate and visualize how substrate and product concentrations evolve over time in enzyme-catalyzed reactions using the Michaelis-Menten model.

Step 1: Launch the App

1. Open MATLAB.
2. Navigate to the folder containing ***Term Project Group 3.zip*** then extract the zip file and open corresponding folder into MATLAB.
3. Open the file named as ***enzyme_gui.m*** and run the file.
4. And following GUI window will open.



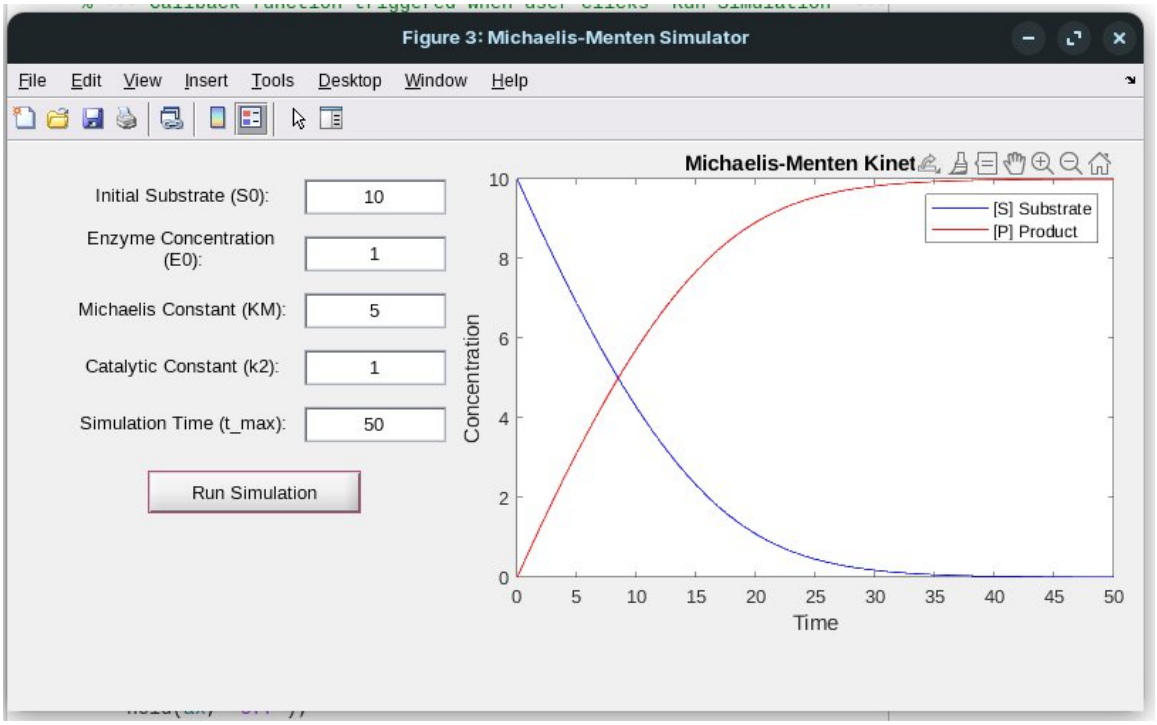
Step 2: Enter Parameters

Fill in each of the 5 input fields in the GUI:

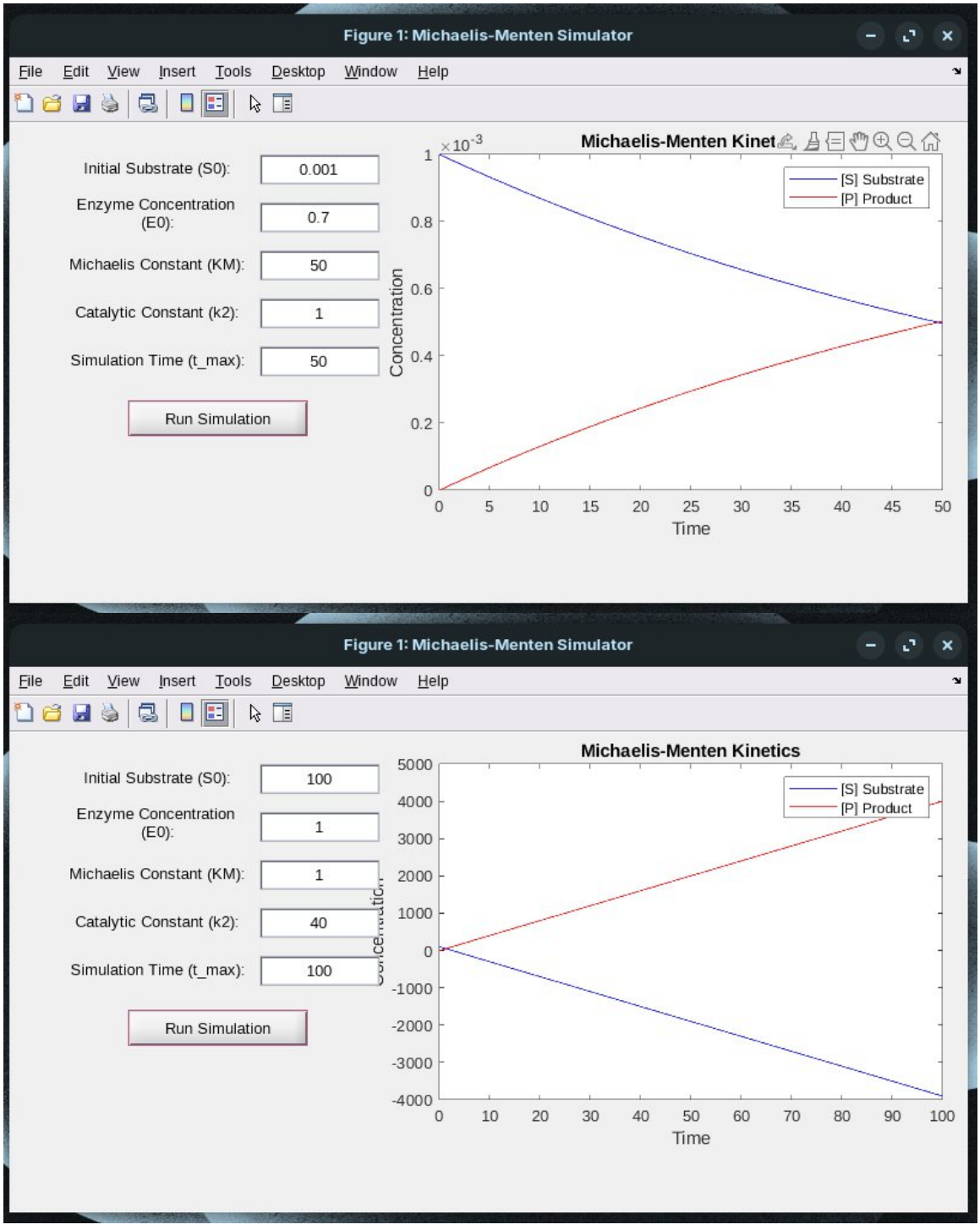
Input Field	Description
Initial Substrate (S_0)	Starting concentration of substrate (e.g., 10M)
Enzyme Concentration (E_0)	Initial enzyme concentration (e.g., 1 M)
Michaelis Constant (K_m)	Efficiency constant of the enzyme (e.g., 5 M)
Catalytic Constant (k_2)	Turnover rate constant (e.g., 1 s^{-1})
Simulation Time (t_{max})	Total duration for the simulation (e.g., 50 seconds)

Step 3: Run the Simulation

Click the 'Run Simulation' button to compute the substrate and product concentrations using a custom Runge-Kutta 4 (RK4) function in file ***RK4.m***



Example Input and Output Window



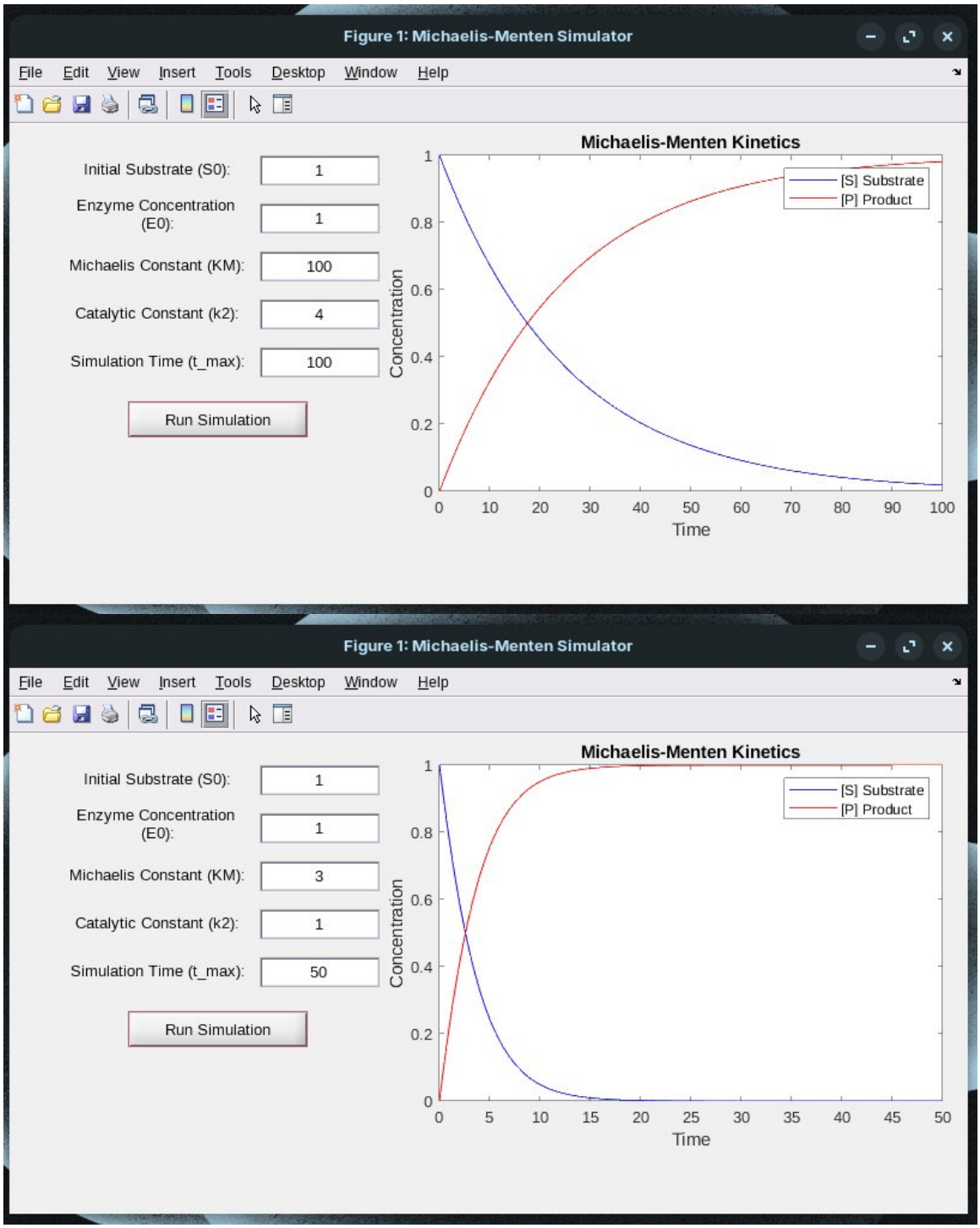


Figure 1: Michaelis-Menten Simulator
File Edit View Insert Tools Desktop Window Help
Initial Substrate (S0): 1
Enzyme Concentration (E0): 1
Michaelis Constant (KM): 100
Catalytic Constant (k2): 4
Simulation Time (t_max): 100
Run Simulation
Michaelis-Menten Kinetics
[S] Substrate
[P] Product
Concentration
Time
0 0.2 0.4 0.6 0.8 1
0 10 20 30 40 50 60 70 80 90 100
Figure 1: Michaelis-Menten Simulator
File Edit View Insert Tools Desktop Window Help
Initial Substrate (S0): 1
Enzyme Concentration (E0): 1
Michaelis Constant (KM): 3
Catalytic Constant (k2): 1
Simulation Time (t_max): 50
Run Simulation
Michaelis-Menten Kinetics
[S] Substrate
[P] Product
Concentration
Time
0 0.2 0.4 0.6 0.8 1
0 5 10 15 20 25 30 35 40 45 50